



Newsletter

Volume 2, Number 1
January-February, 1985

Director's Note

This issue of the newsletter features some of the activities of the Institute's education program. Last July, Dr. Peter Dykeman resigned as Education Coordinator to return to teaching at Rhinebeck High School. Following a national search, we are now in the final stages of recruiting an Education Coordinator, and we hope to begin a new and expanded education program.

The IES Newsletter is published bimonthly by the Institute of Ecosystem Studies at the Mary Flagler Cary Arboretum. Located in Millbrook, New York, the Institute is a division of The New York Botanical Garden. All newsletter correspondence should be addressed to the Editor.

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New Hampshire Governor John Sununu learns about acid rain at a precipitation collection site in the Hubbard Brook Experimental Forest, West Thornton, New Hampshire. From left: Dr. Gene E. Likens, Governor John Sununu, accompanied by Hubbard Brook scientists and State officials.

Rutgers University Graduate Students Taught at IES

Twenty-five graduate students from Rutgers University in New Brunswick, New Jersey participated in a unique educational opportunity at the Institute of Ecosystem Studies (IES) this fall. These students spent three weekends at the Institute for intensive study and field work in ecosystem science.

The weekend field trips were part of an advanced ecology course, "Ecosystem and Community Dynamics," jointly taught by IES staff and Rutgers faculty. Each weekend experience focused on a particular aspect of ecosystem science. Lectures and field work were presented by IES Director Dr. Gene Likens and IES scientists Dr. Charles Canham, Dr. Jonathan Cole, Dr. Clive Jones, Mr. Jay McAninch, Dr. Mark McDonnell, and Dr. David Strayer.

During their first field trip to the Institute, the students conducted a comparative analysis of the structure and composition of a semi-natural hemlock forest at the Mary Flagler Cary Arboretum and a stand of hemlocks in the New York Botanical Garden Forest in the Bronx. Following classroom lectures, the students visited each forest and collected data. Their findings pointed out some marked differences. For example, the Arboretum's hemlocks showed considerable regeneration but the hemlocks in the Bronx had none. This exercise was led by IES terrestrial ecologist Dr. Mark McDonnell.

One of the students' toughest assignments while at the Institute was given to them by aquatic ecologist Dr. David Strayer. The students were asked to estimate the total amount of growth of all invertebrates in the Wappingers Creek for a one-year period. To do this, the students spent a day catching insects in the Creek, including dragonflies, beetles, mayflies, caddis flies, stoneflies, and hellgrammites. They then identified their "catches," and measured and weighed each one. These data were then plugged into mathematical formulas de-

signed to estimate total growth of the insects. This experience exposed the students to problems in quantifying complex ecological processes. This exercise followed classroom instruction on measuring energy flow in aquatic communities.

In another session, the students learned about the role of insects in ecosystems and about insect management. To illustrate constraints in managing ecosystem problems, IES chemical ecologist Dr. Clive Jones led the students through a simulation exercise. The students were presented with the scenario of a gypsy moth outbreak and were asked to play the roles of representatives from various state and local agencies and public interest groups. As representatives, they were instructed to work together to develop a state gypsy moth policy and strategies for controlling outbreaks. Further, they were to develop public information and education programs. The exercise provided the students with a view of the applications of ecosystem science to policy decision-making.

These and other field experiences were interspersed with classroom lectures covering everything from biological, geological, and chemical cycles within ecosystems to ecosystem disturbance, management, and recovery. For example, Dr. Likens lectured on the flow of nutrients within natural and disturbed forest ecosystems. Using Wappingers Creek and the Cary Drive Pond, IES aquatic microbiologist Dr. Jonathan Cole discussed bacterial growth in natural waters. Wildlife ecologist Jay McAninch reviewed vertebrate animal demographics and data collection methodologies.

The coursework at Rutgers University focused on the dynamics of ecological communities and was taught by Dr. Peter Morin, assistant professor of ecology. The students

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Ecologist Hired to Help Save the New York Botanical Garden Forest



Shady path follows the Bronx River along the eastern border of the New York Botanical Garden Forest.

In 1895, the New York Botanical Garden acquired a 16-hectare (40-acre) forest along the Bronx River gorge. One of the few remaining natural areas in New York City, the forest is currently an ecological preserve and study site. The New York Botanical Garden (NYBG) Forest, a remnant of the northern hardwood forest which once covered this area, contains some nearly pure stands of hemlock. Since its acquisition, however, the NYBG Forest has suffered from overuse and abuse by humans, from an overabundant squirrel population, and from air pollution.

There is new hope for the NYBG Forest, however. With a grant from the DeWitt Wallace Fund, Institute of Ecosystem Studies' Director Dr. Gene Likens has appointed Dr. Mark J. McDonnell as the Forest Ecologist. Dr. McDonnell's first task will be to conduct detailed ecological studies of the forest ecosystem. Based on the results of his studies, Dr. McDonnell will work with New York Botanical Garden staff to develop a management plan and an education program for use of the forest.

Originally, concern for the maintenance and preservation of the forest centered on its hemlocks (*Tsuga canadensis*). These hemlocks are among the world's most graceful conifers, growing to 30 meters (100 feet) or more in height. Hemlocks prevail where the soil layer is shallow, underlain by rock, and kept relatively cold and moist by a water course or an underground drainage pattern. Under favorable conditions, a spongy carpet of fallen needles and acid humus builds on the floor beneath the hemlocks, providing a suitable environment for seed germination. Deep shade cast by these dense trees also helps prevent competing species from becoming established. As early

as 1900, staff of the New York Botanical Garden studied the hemlocks' roots, seed production, and seedlings. The results indicated that their concerns were warranted. Unrestricted use of the forest, thin soil, and the hemlock's shallow root system posed problems for its maintenance and regeneration.

More recently, results of a 1980 study by IES wildlife ecologist Jay McAninch gave cause for concern for the entire forest ecosystem, not just the hemlocks. Among his findings, McAninch reported that in many places the forest soil was acidic, dry, and compacted, and that the tree canopy varied widely. He also found that the forest was overpopulated with grey squirrels. These squirrels eat immature cones, acorns, and other seeds, thus interfering with tree regeneration. Further, Mr. McAninch reported that human use was unregulated, and the heavy traffic over many years has resulted in the loss of plant cover and soil compaction.

These problems present major challenges to Dr. McDonnell. Since the beginning of November, he has been reviewing the results of previous studies and formulating his strategy for studying and restoring the forest. He believes that several steps must be taken immediately and concurrently to begin renewal.

Dr. McDonnell's first step will be to establish a permanent grid system that will mark off plots within the forest. With the help of a survey team, he will subdivide all 16 hectares (40 acres) of the forest into discrete, identifiable grid cells. The purpose of the grid system is to be able to pinpoint the exact locations of plants, animals, and study sites within the forest. The grid

system will permit scientists to collect data from precise locations over the years for long-term analyses and to replicate studies at specific sites. Dr. McDonnell anticipates that the surveying and marking of the grid cells will be completed next summer.

A second crucial step will be to establish areas of restricted public access. Currently, human traffic through the forest is unregulated and heavy, especially during the summer months. As a result, there are numerous uncharted footpaths and trails crisscrossing the entire forest. Dr. McDonnell plans to adopt a public trail system restricting traffic to a few established trails. His plans include the use of hand-outs and large signs to direct and educate the public. "I want to make people aware that they have entered the forest, that they've entered a *special* area," Dr. McDonnell said. "This is the only uncut forest in New York City and I want to remind people that they can help save the forest." Perimeter signs will provide direction and general information about the forest, emphasizing its ecology and efforts to preserve it. Although some fencing will be necessary, Dr. McDonnell prefers to rely on natural barriers to discourage public passage. To the extent possible, Dr. McDonnell will use plantings to prevent random access through the forest.

Two research assistants will be hired to help Dr. McDonnell in regulating public use of the forest. During peak season, the assistants will act as guides, interpreting for the public ecological issues demonstrated by the forest. They also will help ensure that visitors remain on public trails, reduce vandalism and litter, and provide for the safety of visitors. The assistants also will help with monitoring scientific research.

The third step for Mr. McDonnell will be to initiate a scientific research program. He emphasizes that the forest is a scientific resource and he would like to encourage cooperative research projects with university scientists. Dr. McDonnell believes that study of the NYBG Forest will lead to a fuller understanding of urban ecosystems in other northern, temperate cities. As public areas are redefined, sites within the forest will be secured for research.

Funding for these initial steps to study and restore the forest has been provided through a grant to the New York Botanical Garden from the DeWitt Wallace Fund. The grant will cover expenses for the first year of study.

Dr. McDonnell was appointed NYBG Forest Ecologist following a national search. His research in landscape ecology, focusing on plant-animal interactions and the effects of human intervention, give him the experience necessary to tackle the problems of an urban forest. Dr. McDonnell received his Ph.D. in ecology from Rutgers University in 1983 and has been a postdoctoral associate at the Institute of Ecosystem Studies since then.

Plant Science Building Addition Under Construction

The plans were completed in September. Hemlocks and hawthorns were transplanted — some to Bacon Flats Lodge, some to the Gifford House. Propane tanks used for heating the Plant Science Building were relocated. The area was cleared, and the bulldozers rolled in. Construction was begun to add office space and other facilities to the Institute of Ecosystem Studies' Plant Science Building.

Within about four weeks' time, the 468 square-meter (5,200 square feet), single-story addition went from a concept to a reality. Ground was broken on October 16, 1984 by contractor R.W. Ciferri, Inc. of Millbrook, N.Y. Ciferri successfully bid on the project and will oversee construction, working with the building's designer, architect James L. Flynn of Poughkeepsie, N.Y. The addition is expected to be ready for occupancy by next summer.

The addition to the Plant Science Building is actually the second phase of alterations to the building to accommodate the Institute's new research and education programs. In the first phase, completed last summer, laboratories were renovated to permit more numerous, and more sophisticated, chemical analyses. The renovations included piping in hot and tap water, not previously available in the labs, as well as installing analytical equipment such as a plasma emission spectrometer, an atomic absorption spectrophotometer, gas and liquid chromatographs, and a separate room for washing glassware.

The new addition will include nine of-



From left: James L. Flynn, architect, R.W. Ciferri, contractor, and Dr. Gene E. Likens, IES Director, review designs for the new office addition to the Plant Science Building.

fices for scientific and administrative staff, secretarial space, and a room for microcomputers. The addition also will contain a lecture room with seating for 25 people. This classroom will be a boon to the Institute's expanding educational programs. (See related stories elsewhere in this newsletter.) Also included in the addition are a fully-equipped lunchroom, a regulation-sized squash court, locker rooms, and showers. The recreational facilities will complement the exercise equipment already in place, and will be available to all IES employees. With

the exception of the squash court, all areas of the new addition will be accessible to the handicapped.

The addition is being built behind the Plant Science Building and will not be visible from the Sharon Turnpike, Route 44A. The addition's exterior will be similar in appearance to the existing building, having a grey stucco finish. Like the Plant Science Building, the addition will be propane heated and centrally air conditioned. Funding for the addition was provided by the Mary Flagler Cary Charitable Trust.

President, British Ecological Society Lectures at Institute

On October 31, the Institute of Ecosystem Studies was honored to have as a guest lecturer the President of the British Ecological Society, Dr. L. Roy Taylor. In his presentation, entitled "Synoptic Monitoring in the Rothamsted Insect Survey," Dr. Taylor discussed how data collected over the past 20 years are used to forecast outbreaks and migrations of aphids, Britain's principal crop-destroying insect. Dr. Taylor has been studying changing patterns in 600-700 insect species. His experience with long-term studies was of particular interest to IES staff, since plans are being developed for long-term ecological studies at the Institute.

Hebb Named Director of Botanical Garden in Virginia

Robert S. Hebb, Horticulturist of the Mary Flagler Cary Arboretum since 1974, has been appointed Executive Director of the Lewis Ginter Botanical Garden in Richmond, Virginia. Mr. Hebb assumed the post on December 1, 1984.

The newly-established Lewis Ginter Botanical Garden encompasses an historic 29-hectare (72-acre) tract of land once belonging to Patrick Henry. As the first Executive Director of the Garden, Mr. Hebb's primary objective will be to develop a master plan for the garden, its research and education programs, and botanical reference services. He will plan and oversee construction of major horticultural displays, including an extensive collection of native Virginia plants.

Commenting on the new appointment, Arboretum Director Dr. Gene E. Likens expressed regret at Mr. Hebb's departure.

"We're all sorry to see Bob leave," said Dr. Likens. "He has been the key figure in the impressive development of the collections of the Arboretum over the last decade. The Board of the Lewis Ginter Botanical Garden has made a superb choice and it is an excellent opportunity for Bob."

Mr. Hebb's most recent project at the Arboretum is the Gifford Perennial Garden, a 1-hectare (3-acre) display garden of low-maintenance perennials. A local fund-raising campaign has raised over \$150,000 and construction has been proceeding since summer. "We're particularly pleased that Bob has agreed to return to the Arboretum as a consultant to see the Perennial Garden through to completion," Dr. Likens said. "He will be back in the spring to oversee the initial plantings and at critical stages thereafter."

RUTGERS STUDENTS . . .
(Continued from page 1)

enrolled in this intensive, one-semester course were primarily first- and second-year graduate students in the botany, ecology, and zoology programs at Rutgers.

The weekend field studies were coordinated by Dr. Mark McDonnell.

Yale Students Take Class Field Trip to IES

Fifteen undergraduates studying ecology at Yale University spent a demanding weekend examining forest and stream habitats at the Mary Flagler Cary Arboretum October 6-7.

Soon after they arrived, IES Director Dr. Gene Likens, also a Professor of Biology at Yale University, lectured to the class about research programs at the Institute. In a lecture-walk on stream organisms, the students forded the East Branch of Wappingers Creek with IES aquatic ecologists Dr. David Strayer and Dr. Jerzy Kolasa to study some of its insects — mayflies, caddis flies, beetles, and water striders. Later, the students hiked through the Mary Flagler Cary Arboretum with plant ecologist Dr. Charles Canham to study native trees and shrubs. Dr. Canham lectured on forest research methodologies, including identifying diseased trees and interpreting the history of a forest from such things as tree core

Winter Calendar

Sunday Programs

Programs begin at 2 p.m. All programs meet at the Gifford House unless otherwise noted. Members are admitted free of charge; admission for others is \$1 for adults and 50¢ for children under 13.

- Jan. 13 Orchids as Houseplants
Meet at Greenhouse.
- Jan. 27 Greenhouse Tour
Meet at Greenhouse.
- Feb. 3 Antarctica
- Feb. 10 Greenhouse Tour
Meet at Greenhouse.
- Feb. 17 Bromeliads
Meet at Greenhouse.
- Mar. 3 A Visit to the Bottom of the Ocean - Submarine ALVIN
- Mar. 10 Houseplant Clinic and Repotting
Meet at Greenhouse.
- Mar. 17 Greenhouse Tour
Meet at Greenhouse.
- Mar. 24 Air Pollution: Its Effects on Plants

Courses

Course dates, lengths and fees vary. Some are part of longer certificate

Landscape Construction I
Landscape Construction II
Fundamentals of Gardening
The Home Fruit Garden
Country Vegetable Garden
Plant Propagation and Grafting
Plants for Landscaping

Ecological Excursion

May 31-June 2 Cape Cod Ecology and Whale Watch

Join IES ecologist Dr. Mark McDonnell in an exploration of Cape Cod geology, flora, and fauna, including a whale-watching cruise. Advance registration is required by April 19.

Scientific Seminars

The Institute's weekly program of scientific seminars features presentations by visiting scientists or Institute staff. All seminars take place in the Plant Science Building on Fridays at 3:30 p.m. Admission is free. For a schedule, contact Julie Morgan at (914) 677-5343.

Arboretum Hours

Mon. through Sat., 9 a.m. to 4 p.m.;
Sun., 1 p.m. to 4 p.m. Gift Shop